

INTERFACE ADAPTOR

FIELD OF THE INVENTION

[0001] This invention relates to interface adaptors, and
5 in particular to interface adaptors for use with opto-electronic devices.

BACKGROUND OF THE INVENTION

[0002] Optical communications systems are conventionally used to provide data and telecommunications at high data rates and over long distances. Optical fibre has many advantages over other communication bearers, for example the huge bandwidth, low attenuation, RFI immunity, etc. One of the disadvantages of certain types of optical fibre is that the light that carries the transmitted data is confined 15 within a very small area, as the typical diameter of the core of an optical fibre is less than $10\mu\text{m}$. Clearly, it is important that great precision is used when connecting two optical fibres together to form a communications link in order to reduce any losses associated with the connection.

20 [0003] If optical fibres are to be joined together permanently then conventionally a splicing machine will be used and typically such machines are able to join single mode fibres such that the loss caused by the connection is around 0.05 dB. When it is desired to connect two fibres 25 together such that the connection can be broken and then remade it is conventional to use a mechanical connector. The optical loss of one of these connectors is much greater than that of an optical splice, and the loss may also be quite variable.

SUMMARY OF THE INVENTION

[0004] According to a first aspect of the invention there
5 is provided an interface adaptor for an opto-electronic
device, the interface adaptor comprising: a first portion
for receiving an optical connector; a second portion for
receiving an opto-electronic device; and a third portion for
connecting said first portion to said second portion,
10 wherein the second portion comprises (a) a first aperture to
receive said opto-electronic device within said second
portion of said interface adaptor; and (b) a second aperture
to receive said opto-electronic device, said first and
second apertures comprising one or more projections located
15 at the periphery of said apertures.

[0005] Said second portion may further comprise one or
more retaining means to resist the removal of an opto-
electronic device from said interface adaptor.

[0006] Said first and second apertures of said second
20 portion may comprise three or more projections located at
the periphery of said apertures.

[0007] Said second portion may further comprise
engagement means such that an opto-electronic device can be
secured relative to said interface adaptor by engaging an
25 opto-electronic device and said engagement means with a
securing device. Said interface adaptor may be formed from
a plastics material or a malleable metal. One or more
plastic regions of said interface adaptor may be coated with

a metallic material or with a film that may be electrically conductive or insulative.

BRIEF DESCRIPTION OF THE DRAWINGS

5 [0008] Figure 1 shows a schematic depiction of an interface adaptor according to the present invention;

[0009] Figures 2 to 5 show a schematic depiction of an interface adaptor according to the present invention from a first perspective view;

10 [0010] Figure 6 shows a schematic depiction of an interface adaptor according to the present invention from a second perspective view;

15 [0011] Figure 7 shows a schematic depiction of an interface adaptor according to the present invention from an end view; and

[0012] Figure 8 shows a schematic depiction of a circuit board incorporating an interface adaptor according to the present invention.

20 [0013] The following description of the preferred embodiment is not intended to limit the invention to these embodiments, but rather to enable any person skilled in the art of packaging opto-electronic components to make and use this invention.

25 [0014] Figure 1 shows a schematic depiction of the present invention. Circuit board 10 comprises optical

transmitter 12 and optical receiver 14, and printed circuits and components 16. The optical transmitter 12 allows modulated light to be transmitted into an optical fibre for onward transmission to a receiver at a remote location and 5 optical receiver 14 enables the detection of modulated light that has been transmitted by a second optical transmitter that is remotely located. The circuits 16 control the signals sent to the optical transmitter 12 for transmission and the electrical signals generated by the optical receiver 10 14. The circuits 16 may perform the modulation and/or demodulation of the transmitter and receiver signals respectively, or they may route the signals to other equipment (not shown) that perform the modulation and/or demodulation. It is conventional for the optical 15 transmitter 12 and the optical receiver 14 to be connected to optical fibres that have been terminated with an optical connector. An interface adaptor 20 according to the present invention comprises a body region 26, a device interface 22 and a connector interface 24. The device interface 22 20 engages with an opto-electronic device, such as an optical transmitter or an optical receiver, and the connector interface 24 is designed to receive an optical connector. As there are a number of different proprietary connectors the connector interface will be designed to be compatible 25 with one of these connector designs.

[0015] Figures 2 to 6 show a schematic depiction of an interface adaptor according to the present invention, with Figures 2-5 showing the interface adaptor in isometric views (top and bottom) and Figure 6 showing the interface adaptor 30 from one side.

[0016] Figure 2 shows a schematic depiction of an interface adaptor 20 according to the present invention, with the device interface 22 comprising an external aperture 221, an internal aperture 222 and securing means 223.

5 Device 14 is shown in greater detail and comprises first device alignment means 141, retention means 142, second device alignment means 143 and electrical contacts 144.

[0017] As can be seen from Figures 3 and 4, when the device 14 is inserted into the interface adaptor 20 the cylindrical region 141 passes through the external aperture and is received within the internal aperture, such that the cylindrical region of the device is held within the body region 26 of the interface adaptor. The retention means 142 is brought into contact with the exterior of the interface adaptor, limiting the further movement of the device into the interface adaptor. The second device alignment means 143 is located relative to the securing means 223 such that mating the clip 28 against the securing means 223 can be used to secure the device 14 relative to the interface adaptor 20 (see Figure 3).

[0018] Figure 5 shows a schematic depiction of an embodiment of the present invention, in which the connector interface 24 and the body region 26 have been selectively coated, in order to reduce the level of electromagnetic emissions from the interface adaptor.

[0019] Figure 6a shows a schematic depiction of a further embodiment of the present invention, with the device 14 being shown in a partial cross-sectional view, with Figure 6b showing a more detailed view of the part of Figure 6a

that is indicated by box A. In order to hold the opto-electronic device in a concentric position such that it will be in optical alignment with a connector that is inserted into the connector interface locating means are provided
5 around the periphery of the external aperture 221 and the internal aperture 222. These locating means may be a continuous ridge, or a plurality of discrete features (not shown). In order to ensure that the opto-electronic device is correctly aligned, it is preferred to use three or more
10 discrete locating means. Additionally, the interface adaptor may further comprise retaining means 27, which allow first device alignment means 142 to pass through as the opto-electronic device is inserted into the interface adaptor, yet resist the removal of the opto-electronic device from
15 the interface adaptor.

[0020] Known techniques for providing an interface between an opto-electronic device and an optical connector are more complex than the interface adaptor of the present invention. Typically, the opto-electronic device would be
20 actively aligned with an assembly comprising the female component of an optical connector and the assembly would be fixed to the device, typically through spot-welding. One advantage of the present invention is that the opto-electronic device may be simply pushed into the interface adaptor and the device retained through a snap-fit connection (and optionally further secured using the clip
25 28), with the geometry of the interface adaptor causing the connector and the device to be in optical communication. The adaptor of the present invention greatly reduces the complexity and the time taken to couple an opto-electronic device to an optical connector. It will be understood that
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there are a range of different optical connectors that may be used (typically a network operator will specify which design of connector is to be used) and the present invention enables the simple removal of an interface adaptor in order 5 for it to be replaced with an interface adaptor that can be used with an optical connector of a different design. This is a significant advantage to equipment manufacturers as it will reduce manufacturing costs, inventory overhead and increase flexibility through the use of modular equipment.

10 [0021] With conventional techniques it is also extremely difficult to remove the assembly from the opto-electronic device without damaging the opto-electronic device. By having an easily removable adaptor it is possible to re-use circuit boards with different optical connectors or to 15 replace an adaptor in the event that its performance is not satisfactory.

[0022] An additional advantage of the interface adaptor according to the present invention is that the opto-electronic device is held much more securely when compared 20 with known techniques. Typically, in known techniques, the opto-electronic device will be secured within an assembly by two spot welds. In the present invention, the opto-electronic device is held in position by two sets of a locating means (preferably four locating means) that act on 25 the opto-electronic device at two different locations. The fact that the device is held at two different locations makes the device less likely

[0023] Figure 7 shows a schematic depiction of an interface adaptor 20 according to the present invention,

with an opto-electronic device 14 coupled to the device interface 22. Figure 7 shows the interface adaptor 20 and the opto-electronic device 14 from the front of the interface adaptor and the connector interface 24. The 5 cylindrical region 141 of the opto-electronic device 14 can be seen received within the internal aperture 222 of the device interface. It can be seen that the internal aperture comprises four concentric locating means 31 that serve to hold the opto-electronic device in the desired position 10 relative to an optical connector. The optical region 148 of the opto-electronic device 14 is held in position such that when an optical connector is inserted into the connector interface 24, the connector and the optical region are in optical communication.

15 [0024] Figure 8a shows a schematic depiction of a circuit board 10 comprising optical transmitter 12 and optical receiver 14, which are connected respectively to interface adaptors 20a and 20b. Figure 8b is a detailed view of the portion of Figure 8a shown in the box B. Interface adaptor 20a is secured to the circuit board 10 by adhesive potting 38a and 38b, and interface adaptor 20b is secured to the circuit board by adhesive potting 39a and 39b.

[0025] The interface adaptor may be conveniently manufactured using plastic injection moulding techniques and 25 conventional amorphous polymers. A preferred material is a polyetherimide (PEI) resin (which is sold by General Electrics under the trade mark Ultem[®]) as it is able to maintain exceptional strength and unaffected modulus at high temperatures. (up to 200°C, T_g of 217°C). Furthermore, this 30 material may be electroplated, in order to provide EMI

shielding for the interface adaptor, has a good resistance to a broad range of chemicals and has inherent flame retardancy properties. The combination of material and process means that it should be possible to produce
5 interface adaptors for approximately \$1, replacing a previously expensive component (\$100+) with one that is effectively disposable. It has been found that the material can be used with the preferred manufacturing technique to control the dimensions of the interface adaptor with an
10 accuracy of \pm 0.025mm. It will be readily understood that other materials, for example mouldable metals, and manufacturing processes may be used if they can provide similar dimensional control and material properties.

[0026] The foregoing disclosure includes the best mode devised by the inventor for practicing the invention. It is apparent, however, that several variations in the present invention may be conceivable by one skilled in the art. Inasmuch as the foregoing disclosure is intended to enable one skilled in the pertinent art to practice the instant
20 invention, it should not be construed to be limited thereby, but should be construed to include such aforementioned variations.